

2 Economic Comparisons of Alternatives

a *Introduction*

Economics play a vital role in the development, operation, and decision-making process of the Forest. Economic efficiency analysis is required by the National Forest Management Act Regulations (36 Code of Federal Regulations 219) and played an important role in the development and evaluation of benchmarks and alternatives. Specifically, the Regulations (36 CFR 291.12(f)) state that the primary goal in formulating alternatives, besides complying with NEPA procedures, is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits. Maximizing net public benefits, however, is also subject to responding effectively to the public issues.

In this section, the key concepts and terms related to economic efficiency are detailed, and differences in economic consequences among the alternatives are presented. Refer to Appendix B, Section IV, for a more detailed discussion of the process.

A goal of the Forest planning process is to produce the greatest net public benefits to society while responding effectively to the issues. Net public benefits are expressed as the overall value to the nation of all receipts and positive effects (benefits) minus all expenditures and negative effects (costs). The alternative which has the greatest excess of benefits over costs has maximized net public benefits.

Net public benefits cannot be totally expressed in dollars or a numeric figure because of the inclusion of some non-quantifiable benefits (e.g., maintaining Threatened and Endangered Species habitat, appreciation of scenic Forest vistas, etc.). Therefore, determining an alternative with the most public benefits is, in a limited way, a subjective decision. It is subjective because the decision requires responding to public issues effectively, which can result in a less-than-optimal present net value. Net public benefits is an indicator that helps to determine which alternative provides the best mix of outputs and effects in response to the public issues.

Present net value (PNV) is a dollar measure of economic efficiency. It is estimated by the difference between the discounted value of all priced benefits less all costs associated with managing the planning area. Stated another way, present net value is an estimate of the current market value of the priced Forest resources minus all costs of producing priced and nonpriced values. Not all benefits or costs are calculated in present net value. For example, the benefit value of Threatened and Endangered Species or the costs of preserving long-term site productivity cannot be estimated. An alternative with the highest present net value means, generally, that the alternative is generating more priced benefits while incurring fewer costs relative to the size of the benefit. However, even if the costs or values associated with the alternatives are incorrect, the relative ranking would remain approximately the same.

The benefits included in the calculation of present net value can be classified into two major types: market and nonmarket. Market goods and services are widely exchanged in actual markets for a monetary price. Nonmarket goods and services are not usually exchanged in actual markets (although some nonmarket items could have a monetary price). Nonmarket outputs have benefit values assigned which estimate what the public would be willing to pay. With values assigned for various goods and services, the nonmarket goods and services can be more equally compared to market goods and services. For the Malheur National Forest planning process, the market benefits consist of timber, minerals, range and commercial anadromous fish harvest; the nonmarket benefits are values associated with recreation, anadromous and resident fish (sportfishing), and big game. These benefits are included in the present net value calculation for all alternatives except the No Change Alternative (present net value for this alternative was developed in the 1979 Timber Resource Management Plan and nonmarket benefits were not analyzed).

The estimated benefit values of both the market and nonmarket items are discussed in Appendix B

The total discounted costs included in the present net value calculation comprise two major components: the direct or budget costs which will be incurred by the Malheur National Forest and indirect costs incurred by purchasers of Malheur timber sales. The direct costs can be further divided into variable and fixed costs. Fixed costs are those items which generally occur regardless of the alternative under consideration. Fixed costs include monitoring, general administration, wilderness management, planning and inventory, genetic tree improvement, law enforcement, minerals management, facility management, and fire management. Variable costs are those items which can be expected to change for each alternative. Variable costs include roads and trails, soil and water improvements, fish and wildlife habitat improvements, recreation administration and improvements, silvicultural activities, timber sale activities, and brush disposal. Indirect costs are costs incurred by timber purchasers as a consequence of removing the timber from the Forest and delivering it to the mill (where it is valued). The indirect costs in the present net value calculation include logging costs, purchaser road maintenance, purchaser slash disposal, and purchaser road credits.

Similar to the benefit values, all cost items are assumed to retain constant real values (1982 dollars) in the future.

**b. Important Differences
in Economic Values
Among Alternatives**

This section compares and discusses the important differences in economic values among the alternatives considered in detail. Economic values used to compare the alternatives include Present Net Value (PNV), discounted costs and benefits, and average annual cash flows and noncash benefits. For reference, the Maximum Present Net Value Benchmark (with Management Requirements) is displayed.

A comparison of the differences in present net value among the alternatives is displayed in Table II-8. The alternatives presented here are ranked in order of decreasing present net value. The table shows the present net value, the total discounted costs, and the total discounted benefits for each alternative. In addition, the change in each of these three items between the alternative with the highest present net value and the alternative with next highest present net value is identified. This continues for each alternative, successively comparing it to the alternative with the next lowest present net value. This is useful to compare alternatives and identify the specific sources of marginal changes in present net value, discounted costs, and discounted benefits caused by the changes in resource management strategies among alternatives.

When compared to the Max PNV benchmark, there is an important difference between PNV values for this benchmark and other alternatives considered. Max PNV generally proposes management of non-commodity resources at a minimum level. The result is a significantly higher PNV value for the Max PNV benchmark from higher benefits being derived from increased timber harvest and AUM levels, with associated tradeoffs in visual quality, recreation quality, fisheries and wildlife habitat. Costs for the Max PNV benchmark were also minimized by considering costs only for timber management. This strategy results in a significantly higher PNV value when compared to the other alternatives due to the production of high levels of commodity outputs without corresponding increased expenditures.

As displayed in Table II-8, Alternative NC has the highest present net value of all alternatives considered in detail, however, there are significant differences in economic assumptions between this alternative and all other alternatives, which make comparisons of economic indicators unreliable. The present net value of the No Change Alternative (Alternative NC) was obtained from the 1979 Timber Resource Management Plan. The present net value calculated in that plan was generated in 1977 dollars, and has been adjusted to 1982 dollars. Benefits and costs included in the present net value calculation

are those associated with timber management; other resource benefits and costs were not considered in the efficiency analysis completed in the 1979 Timber Resource Management Plan, and no attempt has been made to anticipate what those benefits and costs might be now. The maximum present net value benchmark has a higher present net value than all alternatives because of higher outputs of priced resources (especially timber and range), however, this benchmark does not include some resource constraints necessary for acceptable management of the Forest (maintenance of visual quality, important roadless areas, etc.), and all other resources are managed at minimum levels with associated low costs of management.

Alternatives B-Modified, F, A and I (listed in order of decreasing present net value) are alternatives which would have comparatively high timber harvest levels; these harvest levels result in higher present net value than an alternative which would cut less timber (e.g., Alternative C-Modified). The differences in present net value among Alternatives A, B-Modified, F and I are generally due to the effects of different mixes of management strategies for resources such as range, wildlife and fish, visual resources, and roadless areas while maintaining a fairly similar timber management strategy. The significant PNV difference between the Max PNV and other alternatives is primarily due to increases in discounted costs estimated between the Draft and Final Environmental Impact Statements. As timber management activities are modified to satisfy other resource considerations, present net value reductions occur.

For Alternative C-Modified, primarily due to the alternative goal of growing a larger ponderosa pine product, the present net value is estimated to be the lowest. The reductions in present net value for this alternative reflect both reductions in total harvest volumes and longer timber rotations. Alternative C-Modified also has the least amount of suitable timber land available for timber management among all alternatives.

To develop a sense of the contribution of the major Forest resource programs to present net value, the discounted benefits and costs of the major components of present net value are identified in Table II-9. The major sources of benefits identified are timber, range, wildlife (including fish), and recreation. A category labeled "Other" accounts for watershed condition, wilderness, and other revenue sources. It should be noted that almost all of the wildlife benefits are attributable to recreational use of fish and wildlife resources (i.e., Wildlife-and-Fish-User-Days). The "Discounted Costs" side identifies the costs associated with the same resource programs and, additionally, identifies the costs attributable to road construction and maintenance. The "Other" cost category includes all costs not associated with the five identified cost areas (examples include general administration, fire protection, wilderness management, soil and water management, etc.).

**TABLE II-8: Present Net Value and Discounted Benefits
and Costs of Alternatives**
(Million Dollars - 1982)

Alternative (Ranked in order of decreasing PNV)	Discounted PNV	Change	Discounted Benefits	Change	Costs	Change
Max PNV (w/MRs)	472.6		774.3		301.7	
NC (No Change) ^{1/}	381.7	- 90.9	629.6	- 144.7	247.9	- 53.8
B-Mod	350.5	- 31.2	654.0	+24.4	303.5	+55.6
F	328.3	- 22.2	611.7	- 42.3	283.4	- 20.1
A	300.2	- 28.1	577.3	- 34.4	277.1	- 6.3
I (Preferred)	256.6	- 43.6	518.5	- 58.8	261.9	- 15.2
C-Mod	126.4	- 130.2	367.9	- 150.6	241.5	- 20.4

^{1/}The No Change Alternative is based on the 1979 Timber Resource Management Plan. This was not an integrated resource management plan and not all resource uses and outputs were valued. Consequently, there are differences between the economic assumptions underlying the present net value calculations of the No Change Alternative and of all other alternatives which makes comparisons unreliable.



**TABLE II-9: Present Net Value and Discounted Benefits and Costs
by Resource Groups ^{1/}
(Million Dollars - 1982)**

Alternative (Ranked in order of decreasing PNV)	Present Net Value	Discounted Benefits				
		Timber	Wildlife ^{2/}	Range	Recreation	Other ^{3/}
Max PNV (w MRs)	472.6	612 4	81 6	54 9	20 4	5 0
NC (No Change) ^{4/}	381.7	N/A	N/A	N/A	N/A	N/A
B-Mod	350 5	523 3	71 9	32.7	19 6	6 5
F	328 3	483 2	73.4	30 6	18 4	6 1
A	300 2	460 7	63 3	28.8	17.3	5 8
I (Preferred)	256 6	414 8	57 0	25 9	15 6	5.2
C-Mod	126 4	250 1	73 6	22 1	18 4	3.7

^{1/}Comparison of benefits and costs displayed for individual resource outputs indicates general relationships between alternatives. However, they may be misleading because many outputs of multiple use management have common costs of production that cannot be attributed to individual resources.

^{2/}Benefits primarily due to recreation-oriented use of fish and wildlife resources (WFUDs).

^{3/}Category includes wilderness, soil and water, special-uses, and minerals.

^{4/}The No Change Alternative is based on the 1979 Timber Resource Management Plan. This Plan was not an integrated resource management plan, and not all resource uses and outputs were valued. Consequently, there are differences in economic assumptions underlying the present net value calculations of the No Change Alternative and all other alternatives.

Alternative (Ranked in order of decreasing PNV)	Discounted Costs					
	Timber	Wildlife	Range	Roads/ ^{5/}	Recreation	Other/ ^{6/}
Max PNV (w/MRs)	167 0	5 9	36 1	66.0	2 0	24 7
NC (No Change)	N/A	N/A	N/A	N/A	N/A	N/A
B-Mod	139 6	15 2	18 2	51 6	6 1	72 9
F	124 7	5 7	17 0	53 9	8 5	73 7
A	121 9	5.5	13 9	55 4	8.3	72 0
I (Preferred)	115 2	5 2	13 1	52 4	7 9	68.1
C-Mod	82 4	9.7	14 5	50 7	9.7	84.5

^{5/}Primarily road construction, reconstruction, and maintenance related to timber management.

^{6/}Category includes general administration, fire protection, wilderness, lands, minerals, soil and water, and special-use management.

*c. Differences in
Benefits, Costs, and Cash
Flows*

Table II-10 presents the cash and noncash benefits projected for each alternative for the first and fifth decade. The total receipts consist of receipts from timber sales, range use, and other receipts from minerals and special uses. For every alternative, the timber sale program accounts for at least 99 percent of the total value of the receipts. The total costs identified are all direct costs of Forest management which would be financed by the Forest budget. The difference between the total receipts and total costs is the net cash receipts. The noncash benefits identified include the value of recreation, fish and wildlife (primarily recreation use), watershed, and some range values not reflected in grazing fees. All values are in 1982 dollars.

As shown in Table II-10 for Decade 1, the differences between the total receipts of Alternatives A, F, B-Modified, and I are relatively small, these alternatives have first decade total receipts ranging from \$34.3 to \$28.1 million. Generally, the receipts decrease as timber harvests decrease, reflecting the dependence of receipts upon timber harvests. Alternative C-Modified has lower total receipts reflecting lower timber harvests, first decade total receipts run about \$15.7 million. Noncash benefit variation among alternatives is unknown.

The No Change Alternative is included in Table II-10; however, no values are available for comparison purposes. The No Change Alternative is based on the 1979 Timber Resource Management Plan, and was not developed in a comparable fashion to the other alternatives.

Differences in total costs by alternative are primarily due to varying levels of capital investments (timber, range, soil and water, and fish and wildlife improvements). To a lesser degree, differences in operational costs (e.g., timber sale preparation) due to varying harvest levels among the alternatives also results in differing total costs by alternative.

Between the Draft and Final Environmental Impact Statements, cost updates to the Forest Cost Package resulted in higher projected costs for implementation of all alternatives. For example, though it was evident that Alternative B-Modified generates the highest amount of total discounted benefits of all alternatives through extensive investments in many aspects of Forest management; the discounted costs of this alternative are also higher than any other alternative. Higher discounted costs associated with Alternative B-Modified are partly due to increased expenditures for wildlife programs which are not matched by increased benefits (utilization of available forage by cattle results in no significant increases in elk herds despite habitat improvement investments). Timber costs are also higher under this alternative due to the higher level of management intensity necessary for increased outputs of these resources. The end result of updating the costs of implementation considered for the Final Environmental Impact Statement, such as with Alternative B-Modified, is that PNV comparisons between alternatives have become more reliable.

The costs required to operate the Forest generally decrease over time (i.e., from Decade 1 to Decade 5) for all alternatives because less capital investments are needed for new roads. Projections are that most of the system will be in place by 2030. Under all alternatives, local road construction would decrease from Decade 1 levels by 85 percent or more in Decade 5.

TABLE II-10: Average Annual Cash Flows and Noncash Benefits in the First and Fifth Decades by Alternative (Million Dollars - 1982)
(First decade planned, subsequent decades projected)

Alternative (Ranked in order of decreasing PNV)	Decade 1				Decade 5			
	Net Receipts	Total Costs	Total Receipts	Noncash Benefits to Users	Net Receipts	Total Costs	Total Receipts	Noncash Benefits to Users
Max PNV (w/MRs)	13 9	14 0	27 9	6 3	18 5	13 6	32 1	8 3
NC (No Change) ^{1/}	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
B-Mod	10 3	19 3	25 3	6 3	17 5	16 8	34 3	9 0
F	11 2	16 0	27 2	6 0	19 1	15 2	34 3	8 2
A (No Action)	10 1	15 2	25 3	5 8	17 4	15 2	32 6	7 5
I (Preferred)	7 7	15 9	23 6	5 8	13 6	14 5	28 1	8 2
C-Mod	5 2	12 3	17 5	5 6	4 1	11 6	15 7	8 4

^{1/}The No Change Alternative is based on the 1979 Timber Resource Management Plan. This plan was not an integrated resource management plan and not all resource uses and outputs were valued. Consequently, there are differences in economic assumptions underlying the present net value calculations of the No Change Alternative and all other alternatives.

3 Major Tradeoffs Among Alternatives

This section summarizes the relationships among the economic and social effects discussed in this chapter and the responses of the alternatives to the issues discussed in Chapter I and Appendix A. The purpose is to highlight major tradeoffs or differences among alternatives. Further discussion of differences is found in the previous sections of this chapter and in Chapter IV.

To provide a framework for assessing tradeoffs, the long-term National, Regional, and Local resource demands or needs are briefly summarized (more detail is provided in Chapter III). The responses of the alternatives to the issues are displayed in Table II-11, and selected economic values and indicators of responsiveness to the issues are displayed in Table II-12. The differences and similarities among individual alternatives are then summarized.

a National, Regional, and Local Overview

The Environmental Impact Statement for the 1985 Resources Planning Act Program estimates that total National demands will rise for all outputs of the National Forests. At the same time, there is a strong demand to protect and enhance the quality of the environment.

The Regional Guide for the Pacific Northwest Region estimates that demands for all outputs of National Forests will rise in Oregon and Washington. Recreation use is expected to increase as the population increases and its characteristics change, with the bulk of recreation use coming from residents of the region. Demand for wilderness recreation is expected to exceed the supply within the Region's Wilderness Preservation System. Demand could be met, in the near future at least, by utilization of undeveloped lands outside wildernesses. Development of these lands would intensify pressure on the designated wildernesses.